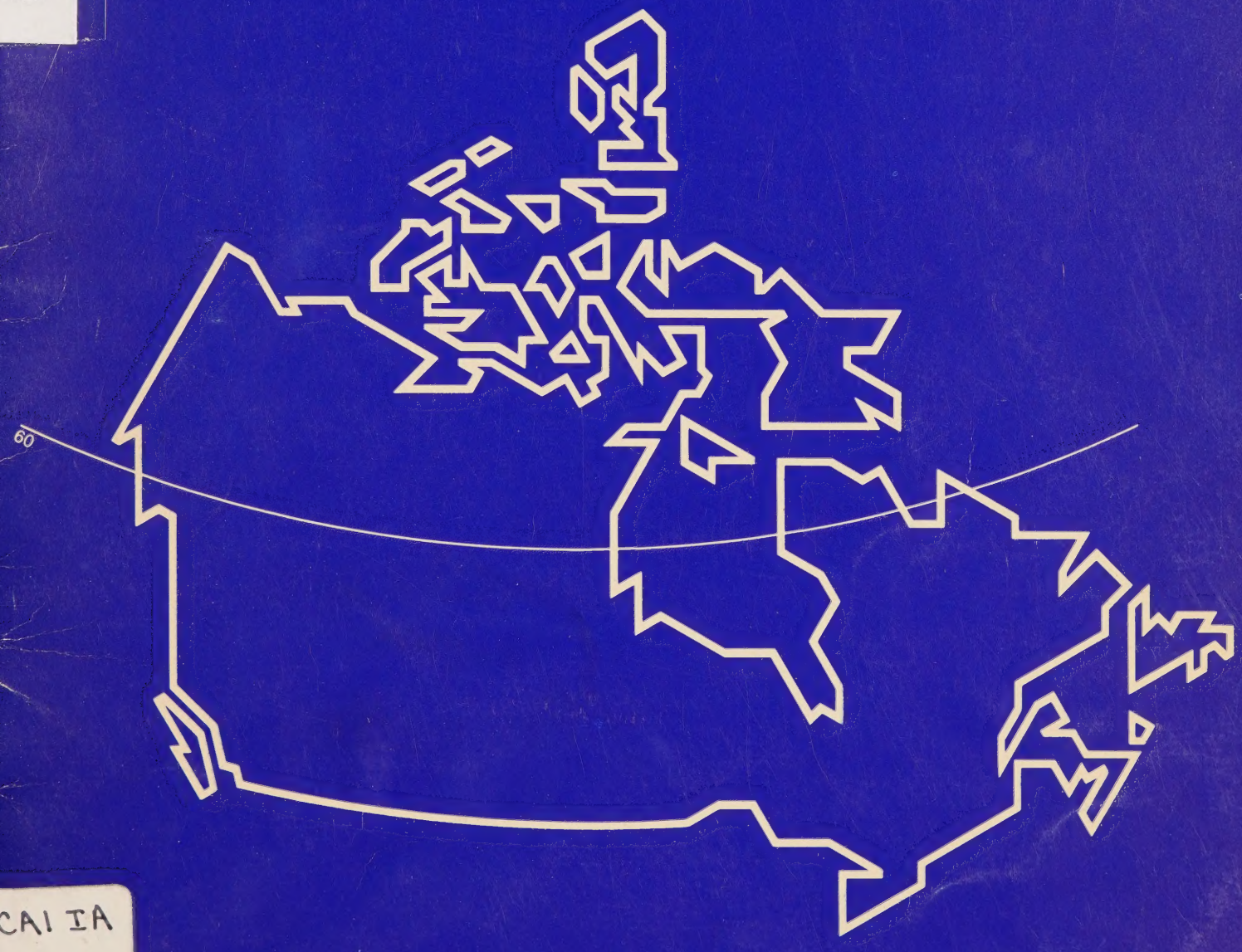
North of 60

Toward a Northern Balance

By John K. Naysmith



Toward a Northern Balance

By John K. Naysmith

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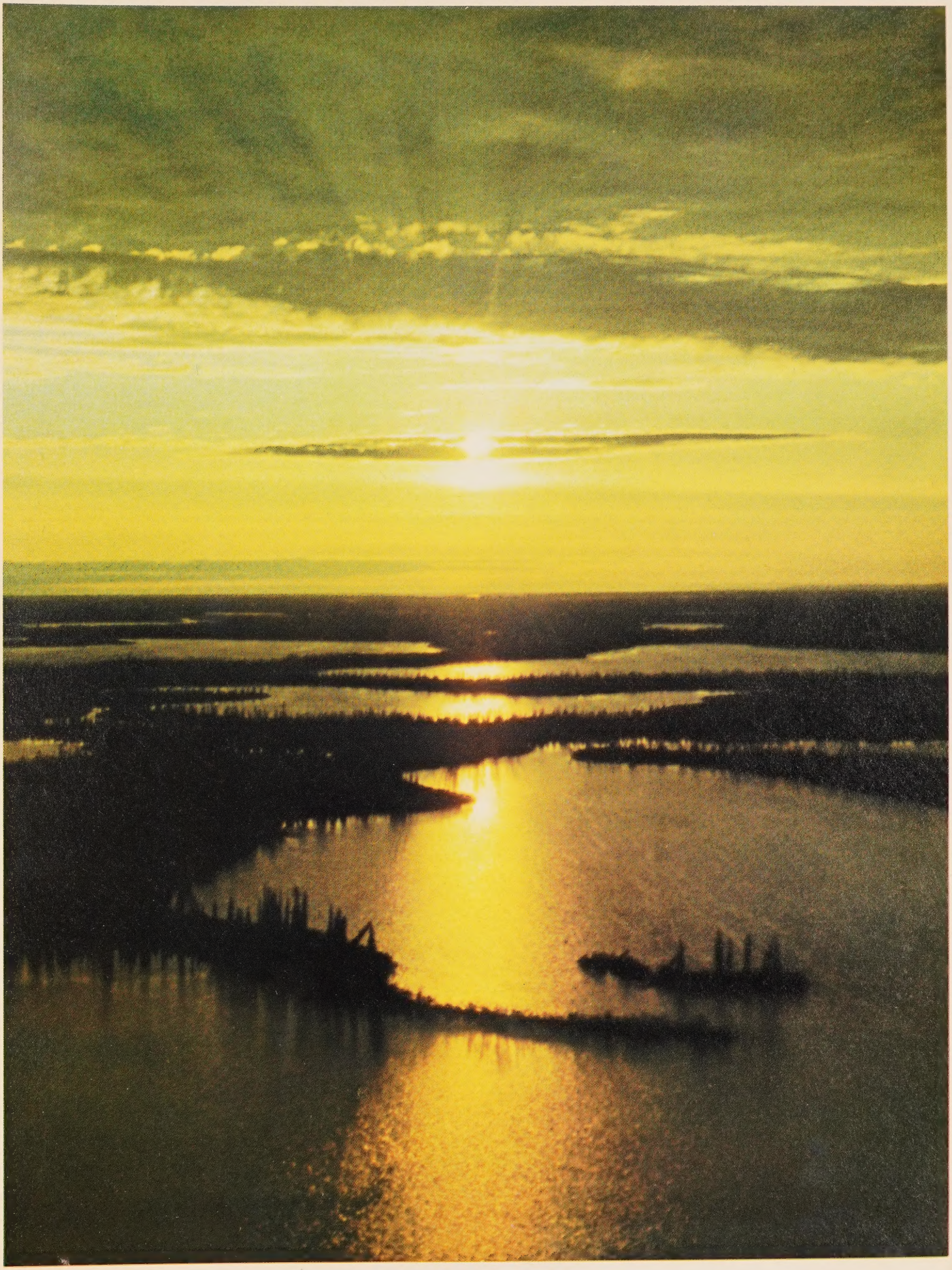

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Preface

This paper is intended to provide an analysis of the water, forest and land management program in Canada's north. It is suggested that the administration and management of publicly-owned natural resources are sufficiently complex to warrant considerable frank and informed public discussion. It must be pointed out, however, that this paper does not discuss such issues in terms of relative advantages and disadvantages of northern development; rather it is based on the premise that the north's renewable resources can be managed successfully to the benefit of all Canadians in perpetuity.

Under the Canadian Government Organization Act of 1966, the Department of Indian Affairs and Northern Development was formed and its Minister assigned the responsibility for administering those resources of the Yukon and Northwest Territories not already assigned to other departments or agencies of the Canadian Government.[1]

The Act also states that the Department of Indian Affairs and Northern Development has a research function and that "the Minister shall be responsible for fostering, through scientific investigation and technology, knowledge of the Canadian north and of the means of dealing with conditions related to its further development".

Between 1966 and 1968 the main thrust of the department's northern program was the development of the oil, gas and mineral potential of Canada's north. Meanwhile, concern for the "above-surface" resources was limited to forest-fire protection, a function which had been carried out by various federal departments dating back several decades. By 1968 it became apparent that a comprehensive program for the management of the north's *renewable resources* was required. To this end, a new division was formed with a mandate to develop policy and programs for the management and protection of the *water, forest and land* of the Yukon and Northwest Territories.

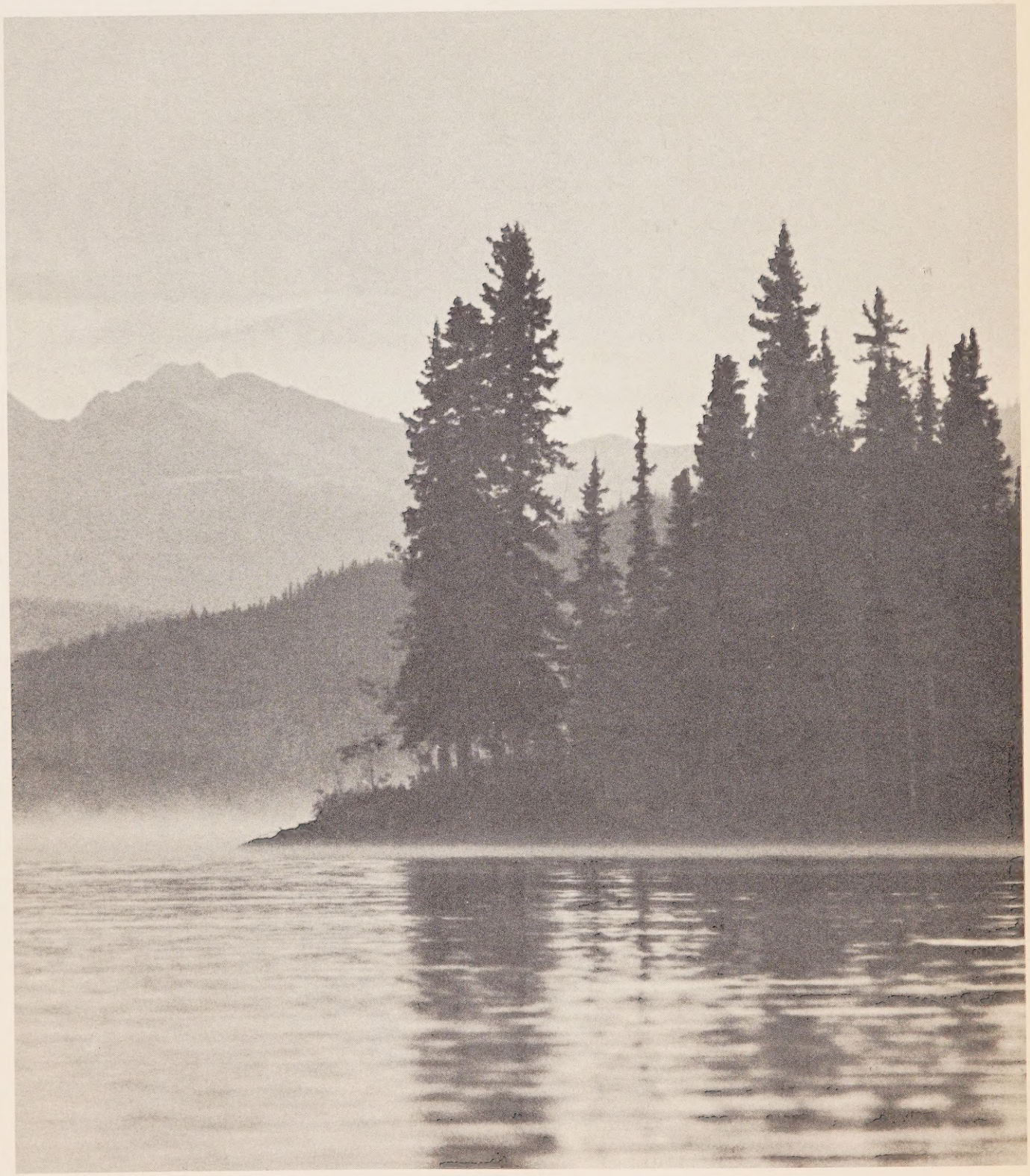
[1] Responsibility for water, forests, land, oil, gas, and minerals rests with Indian Affairs and Northern Development; fisheries and migratory birds with the Department of the Environment; and wildlife with the Governments of the Yukon and Northwest Territories.

An earlier paper[2] described the conceptual framework upon which the program was being established and discussed the central position of man in the resource spectrum. This paper which discusses the program as it has been implemented thus far, concludes with a proposal for land-use planning in Canada's north.

Several officers of the Water, Forests and Land program contributed to Part I of the paper dealing with the present program and I would like to thank in particular Messrs. R.J. Goudie; A.H. Jones; W.J. Moore and A.D. Kiil for their assistance. Although I must take full responsibility for the proposal outlined in Part II of the paper I should add that I am very grateful to several colleagues of the Northern Affairs Program who read the manuscript, provided advice, suggestions and, indeed, words of warning on various aspects of it. Consequently I wish to thank in particular, Mr. A.B. Yates, Director, Policy and Planning Branch; Mr. D.A. Davidson, Director, Territorial and Social Development Branch; Dr. J. Riddick, Manager, Arctic Land Use Research Program; Messrs. B.J. Trevor and L.V. Brandon, respectively Regional Director of Resources and Regional Manager, Water, Forests and Land, Yukon Territory and Mr. D.J. Gee, Regional Manager, Water, Forests and Land, Northwest Territories. In conclusion, I should like to express my thanks to Messrs. R. Laviolette and W. Cox who prepared the charts and maps and Mr. R.A. Knowles, formerly of this department, who, as a personal favour, edited the manuscript.

John K. Naysmith
May 10, 1973

[2] Naysmith, J. K. *Canada North – Man and the Land.* Ottawa, Department Indian and Northern Affairs 1971. Cat. No. R72-6770. 44p.



Part I
The Program

Water

A quick examination of the map would seem to indicate that Canada's Yukon and Northwest Territories are richly endowed with fresh water. Certain factors, however, such as low annual precipitation, a short frost-free period and permafrost soils tend to make the volume of *available* water significantly less. This, coupled with the fact that northern water is particularly susceptible to contamination due to a relatively low capacity to assimilate waste, makes it imperative for Canada to have a substantial program for the management and protection of her northern waters.

Traditionally the Indian and Inuit of the north have relied heavily upon the resources of inland and coastal waters to obtain food, and cash crops. Although this traditional pattern persists it does so on what appears to be a declining scale. Conversely, northern waters are being used increasingly from the standpoint of transportation, hydro-power, industrial and municipal requirements, sports fishing and recreation.

Prior to 1970 several pieces of federal legislation applied to water in northern Canada and included the *Canada Shipping Act,* the *Dominion Water Power Act* and the *Fisheries Act.* Each of these Acts has specific objectives none of which provides for planning and management of water use.

As part of the water, forest and land management program for the north the Canadian Government proclaimed the *Northern Inland Waters Act* in February 1972 and Regulations under the Act were promulgated in September of the same year.

The Northern Inland Waters Act

The objective of the Northern Inland Waters Act is "to provide for the conservation, development and utilization of the water resources of the Yukon Territory and the Northwest Territories in a manner that will provide the optimum benefit therefrom for all Canadians and for the residents of the Yukon Territory and Northwest Territories in particular." In each Territory there is established under section 7 of the Act a Territorial Water Board responsible for meeting this objective.

The composition of each Board is determined by the Act and includes six officials from those federal agencies which have a direct working interest in water management in the north, viz., Environment; National Health and Welfare; Indian and Northern Affairs; Public Works; Energy, Mines and Resources; Transport; and three persons named by the Commissioner of the respective Territory.

Under the Act the property in and the right to the use and flow of all water (in the Yukon and Northwest Territories; ed. note) are for all purposes vested in the Crown and excluding use for domestic purposes by a person occupying lands adjacent to such waters, no other person is permitted to use waters within a management area unless he is licenced to do so.

Also, under the Act the Governor in Council may reserve from disposition all or any interests in territorial lands under control of the Minister of Indian and Northern Affairs where such interests are in his opinion required for the protection of any water resource.

The Board is responsible for:

a) conducting *public hearings* relating to all applications for water licences (such hearings in connection with any matter related to the objectives of the Act):
b) ensuring that a licence applicant submits such *information and studies* as will enable the Board to evaluate the qualitative and quantitative effects of the proposed water use on the water management area; and
c) setting *water standards* in order to maintain the natural high quality of northern waters. With respect to the conditions implicit in a licence the Water Board must maintain the effluent standards that are consistent with the Canada Water Act, the Fisheries Act and the Territorial Public Health Ordinances.

The Regulations pursuant to the Northern Inland Waters Act establish certain geographic areas as Water Management Areas; classify uses of water; set out application and water use fees; describe the information required with an application; and list those uses of water for which no licence is required. Under the Regulations the Board may require an applicant to furnish security in an amount not exceeding $100,000 or 10 per cent of the estimated capital cost of the work, whichever is greater.

The first public hearing under the Northern Inland Waters Act, which was held by the Yukon Territory Water Board in May 1972, dealt with an application from the Northern Canada Power Commission. The Commission had filed an

application with the Board to use water from Aishihik Lake to generate hydro-electric power in the vicinity of Otter Falls on the Aishihik River.

The public hearing provided a forum for the Commission to explain its proposal and to describe the physical work that had to be undertaken in order to meet the objective of the proposal. It also afforded the public, as individuals or organizations, an opportunity to express support for, or opposition to, the project.

Prior to the May hearing the Water Board (so that it could more accurately assess the proposal) requested the Northern Canada Power Commission to undertake studies to:

a) determine flows and levels in the water bodies affected;
b) determine maximum flood and demonstrate the routing of such a flood through the system;
c) delineate contours of various flood levels in the storage system;
d) produce restoration plans for all areas affected by construction;
e) investigate the existing water supply of Aishihik village; and
f) provide a plan for its relocation if necessary.

Briefs presented at the May hearing brought out many significant points which, in some cases, demonstrated the need for the Commission to conduct further investigations.

For example, additional studies were carried out on:

a) fish ecology and habitat, particularly under winter conditions;
b) design alterations to ensure a sufficient flow over Otter Falls to preserve its aesthetic value;
c) design alterations to preserve an archaeological site-traditional burial ground at the native village on the shore of Aishihik Lake; and
d) the economic justification of the project.

This series of studies was followed by a second hearing in January 1973. As a result of that hearing the Yukon Territorial Water Board submitted its findings to the Minister with the recommendation that he approve the issue of a water licence to the Northern Canada Power Commission. This measure would allow the Commission to carry out the proposed development but under specific conditions related to maximum lake levels, the amount of storage capacity and the volume of flow over Otter Falls. In April 1973 the Minister of Indian Affairs and Northern Development accepted the recommendation of the Board and a water licence was issued.

The Arctic Waters Pollution Prevention Act

Complementary to the inland water legislation described above is the Arctic Waters Pollution Prevention Act which applies to the coastal waters of the Canadian Arctic. More specifically the Act applies to the waters adjacent to the mainland and the islands of the Canadian Arctic within the area enclosed by the 60th parallel of north latitude, the 141st meridian of longitude and a line measured seaward from the nearest Canadian land a distance of 100 nautical miles; except where the line of equidistance between the Canadian Arctic Islands and Greenland is less than 100 nautical miles in which case it is simply the line of equidistance.

Precipitated by increased oil and gas exploration activity in the Arctic and the possibility of massive movements of oil by tanker or pipeline, the Act and pursuant Regulations (both of which became law in 1972) reflect the Canadian Government's responsibility for the well-being of the Eskimo people and other inhabitants of the area and its concern for the preservation of the arctic waters.

The Arctic Waters Pollution Prevention Act is administered by three federal departments:

a) the Ministry of Transport—for shipping activities in arctic waters;
b) the Department of Indian and Northern Affairs—for non-shipping activities (e.g. off-shore drilling operations or coastal based installations) north of the 60th parallel, except Hudson Bay and Hudson Strait; and
c) the Department of Energy, Mines and Resources—for non-shipping activities in Hudson Bay and Hudson Strait.

The purpose of the Act is to prevent the pollution of arctic waters by prohibiting the deposit of waste in the water or on the mainland or islands under conditions which might result in the waste entering the water. Violation of the Act dealing with waste deposit is an offence and so is the failure to report such an incident.

The Act provides for civil liability in connection with an undertaking in or adjacent to arctic waters and specifies the financial responsibilities of an operator. For example, according to the Regulations, the operator of an off-shore drilling rig is liable up to ten million dollars for each well from which the deposit of waste originates to a maximum of fifty million dollars.

Under the Act the Governor in Council, with authority delegated to the Minister, may require any person who proposes to construct or alter any works on the coast or in the water, to provide him with plans and specifications of such undertakings.

Part I of the Arctic Waters Pollution Prevention Regulations applies to the deposit of waste by non-shipping activities in arctic waters or on the mainland or islands if the waste might enter arctic waters. Industrial waste may be deposited under conditions authorized by or under the Oil and Gas Production and Conservation Act, the Territorial Lands Act or the Public Lands Grants Act, whichever is applicable. The respective administrative responsibility of the departments of Indian and Northern Affairs, and Energy, Mines and Resources for this aspect of the Regulations is the same as that described earlier with respect to the Act.

With respect to shipping activities, *Arctic Shipping Pollution Prevention Regulations* pursuant to the Act have been promulgated and are administered by the Ministry of Transport. These regulations prescribe the shipping safety control zones, the standards to which ships must comply when operating within the zones and the standards related to ship construction, navigating equipment, charts and publications, radio equipment and bunkering stations.

Forests

The forests north of the 60th parallel cover some 250,000 square miles (650,000 km^2) between the Alaska-Yukon border and the tree line which roughly extends from the Mackenzie Delta past the east end of Great Slave Lake to the Northwest Territories-Saskatchewan border. The northern forest consists of three distinct forest regions; boreal, alpine tundra and sub-arctic forest tundra transitional.

From the standpoint of timber harvesting the northern forest is not yet a significant economic factor. It is however, valuable in terms of wildlife habitat, both for traditional hunting, trapping and sport hunting; recreation, watershed management and erosion control.

Fire Management

Although forest fire control in the north is, and traditionally has been, carried out by the Federal Government the authority to do so is provided by Territorial Government legislation in the form of the Yukon and Northwest Territories Forest Protection Ordinances. The regulations under the Ordinances provide for the establishment of the fire season, issuing of burning permits, means to close forests during high hazard periods, hiring of fire-fighters and penalties for violating provisions of the Ordinances.

In recent years a total of about 400 fires have occurred annually in the two Territories; about 55% of these were man-caused; the remainder were attributed to lightning. As a direct result of the increase in the general level of activity in the north during the 1960's the incidence of man-caused fires rose significantly. In view of this and in an attempt to make the best use of available men and resources a policy was implemented in 1967 whereby Protected and Non-Protected Zones were established and Priority Areas within the Protected Zones were defined. Under that policy the area being protected was still in excess of 180,000 square miles (460,000 km^2). A refinement of the 1967 policy is currently underway in order to determine the level of fire control capability required to meet the needs of northerners for the protection of life, property and resources and to provide a realistic allocation of funds and effort commensurate with the resource values being protected.

Timber Management

The total commercially productive forest area of the two Territories covers approximately 70,000 square miles (180,000 km^2) and supports an estimated 25 billion cubic feet (700 million m^3) of timber.

Current annual timber production in the north is approximately 5 million cubic feet (140 thousand m^3). Intended primarily for the local market the output consists of sawlogs, mine timber and firewood. Local timber consumption is small relative to the estimated coniferous annual allowable cut of 40 million cubic feet (1.1 million m^3). However, it will probably increase significantly over the next decade. Based on demand projections for North America and considering available resources it is possible that by the 1990's the full allowable coniferous cut for the two Territories will be utilized.[3]

Under the Territorial Lands Act the Governor in Council may make regulations concerning the issuing of permits to harvest timber, prescribing the terms and conditions under which timber can be cut, and prescribing the dues to be paid for timber harvested.

The Territorial Timber Regulations pursuant to the Territorial Lands Act, authorizes the Minister of Indian and Northern Affairs to issue permits for the cutting and removal of timber and, if the volume does not exceed two and one-half million board feet annually, delegates this authority to an Officer of the Lands and Forest Service. The Regulations describe the dues structure and set out specific conditions with respect to roads built within the permit area and the cutting of timber in relation to roads and lake shores. The whole matter of forest policy is currently under review, particularly with respect to the question of timber disposal and cutting rights; and major amendments to the Territorial Timber Regulations, will, therefore, probably be made in the fall of 1973.

After the end of the second World War two federal agencies—the Yukon and Mackenzie Forest Services—were formed to carry out forest fire control operations in the Yukon Territory and the Mackenzie District of the Northwest Territories. In 1970 the Department of Indian and Northern Affairs established two new field organizations, the Yukon Lands and Forest Service and the Northwest Lands and Forest Service. These two organizations were given a broader range of responsibilities and, in the process, absorbed the two original fire control agencies. These two Services are responsible for operational implementation of resource policy related to fire, timber and land-use management. The two Lands and Forest Services are discussed in more detail later under the heading of 'Organization'.

[3]Naysmith, J.K. *The Future Value of Canada's Northern Forests* Ottawa, Dept. Indian and Northern Affairs. 1970. 21p

Land

Authority for dealing with the administration and protection of northern Crown lands, which are under the direct control of the Minister of Indian Affairs and Northern Development, is derived from the *Territorial Lands Act.* This authority extends to virtually all of the 1.46 million square miles (3.78 million km^2) of the Yukon and Northwest Territories, but does not include lands which have been transferred to other federal departments for such purposes as airports. Moreover, it does not include lands encompassing communities which have been transferred to the administration and control of the two Territorial Governments.

The original Territorial Lands Act (1952), and its regulations provided for:

a) the sale and lease of lands;
b) the lease of mining and mineral rights in the Northwest Territories (the Yukon Quartz Mining Act and the Yukon Placer Mining Act are the pertinent Acts in this regard in the Yukon);
c) quarries*;
d) oil and gas permits and coal leases; and
e) for the management and leasing of timber rights.

The whole matter of land disposal, herafter referred to as *Land Administration*, is now under review and represents one area in which much work has yet to be done. In addition to the discussion which follows, the matter of Land Administration is considered in some detail in Part II of this paper.

Although the original Act did provide authority for the disposition of public domain in the Territories it contained no specific provision for the *management or protection* of the land. In considering the question of northern lands it is necessary to note the distinction to be drawn between *Land Administration*, which deals with the disposition of land through the transfer of rights, and *Land Use Management*, the objective of which is to minimize disturbance to the land.

*The removal of quarry material, including limestone, granite, slate, gravel, sand and stone, is authorized by lease or permit under the Territorial Quarrying Regulations. A study is currently underway in the Mackenzie Valley of the N.W.T. to determine the availability and quality of material potentially available to major undertakings, such as the Mackenzie Highway or a possible pipeline. The study will also identify the deposits which should be set apart for community use only, to ensure that adequate granular materials are available to meet local needs.

Land Administration
In the matter of land disposal one objective of the Department is the prevention of speculation. A policy has therefore been developed whereby applicants are required to demonstrate a need for the land and to set out a specific proposal for development of the land during the initial period of occupancy. It follows that the area of any parcel leased or sold shall not be in excess of what is required. While it is possible to purchase lands under the current provisions of the Territorial Land Regulations, the Department prefers to see the initial occupation controlled by lease agreement.

Applications to acquire surface rights are accepted by appointed Land Agents, located in most of the major communities throughout the Territories. Normally, Land Agents carry out a field investigation with respect to the application and then forward their recommendation together with the application to the appropriate Supervisor of Lands in the regional office in Whitehorse or Yellowknife. Territorial Land Regulations provide that the applicant must personally select the lands in which he is interested thereby precluding the possibility of non-residents acquiring land through correspondence.

Where some form of land tenure is required, permits for major undertakings may include various stipulations with respect to protecting the land. For example, under the Territorial Lands Act the Governor in Council may authorise acquisition of a right-of-way for a pipeline project, subject to such terms and conditions as may be deemed proper.

In 1971 a company acquired a right-of-way straddling the Yukon and Northwest Territories boundary, some 32 miles long and containing 256 acres, for purpose of constructing a gas pipeline. The term of the permit is 25 years, renewable for a further term of 25 years at an annual per acre fee which is subject to review every five years.

The land permit contains several clauses dealing with:

a) erosion controls;
b) surface subsidence and melting of permafrost;
c) precautions against landslides;
d) revegetation of right-of-way;
e) stream crossings and river bank restoration;
f) disposal of garbage, waste and debris; and
g) preservation or pre-arranged working of archaeological sites.

In addition, the permit requires the operator to provide a substantial deposit to guarantee the observance of the terms and conditions during the period of construction. Following construction but for the remainder of the term of the permit a reduced guarantee deposit is required. The costs of any action necessary to remedy a failure to comply with the terms and conditions of the permit may be charged against the security deposit.

Prior to granting the permit for the pipeline right-of-way, discussed above, the Department of Indian Affairs and Northern Development required the applicant to submit an environmental assessment of the proposal.

Returning to the broader issue of land administration under the Territorial Lands Act the Governor in Council may do any one of the following:

a) withdraw lands from disposal;
b) set apart and appropriate lands for use as national forests, game preserves and sanctuaries, national parks or for any other similar public purpose;
c) authorize the acquisition of rights-of-way for railway road beds, transmission lines or pipelines; and
d) make regulations or orders for the holding of inquiries with respect to any questions affecting Territorial lands, i.e., call public hearings.

Land Use Management
As indicated above the Territorial Lands Act, through the application of certain terms and conditions, does exercise a measure of control over land-uses that require some form of long-term tenure. However, by the late 1960's extensive land-use operations were being conducted in the north under the authority of exploration permits which did not require any land-tenure agreement. Consequently, an important amendment to the Territorial Lands Act was passed by the House of Commons in 1970 and proclaimed in 1971 at which time *Territorial Land Use Regulations* came into effect.

The objective of the *1970 Amendment to the Territorial Lands Act* is to provide for the managed-use of the Lands in the Yukon Territory and Northwest Territories in a manner which will not preclude their utilization but which will minimize degradation of the land surface.

Under the Amendment the Governor in Council may make regulations respecting the protection, control and use of the surface of all territorial lands. In addition to these general conditions which apply throughout the north, the Governor in Council, where he deems it necessary for the protection of the ecological balance or physical characteristics of any area, may, after consultation with the appropriate Councils of the Yukon Territory or Northwest Territories, set apart and appropriate territorial lands as a *land management zone.*

With specific reference to those areas designated as management zones, the Governor in Council may, after consultation with the Council of the Yukon Territory or Northwest Territories make regulations respecting the protection, control and use of the land surface. He may also make regulations respecting the issue of *permits* for the use of the surface land within a management zone and the terms and conditions of such permits.

The *Territorial Land Use Regulations* were promulgated in November 1971. In addition to providing general rules for the protection of the land, they describe the terms and conditions which may be included in a land-use permit required for any operation carried out within a land-management zone.

Under Section 21 of the Regulations any land-use permit may include conditions pertinent to the:

a) location and the area of lands that the operator may use;
b) times during which the land-use operation may be carried out;
c) type and size of equipment that may be used;
d) methods and techniques to be employed by the operator;
e) type, location, capacity and operation of all facilities to be used by the operator;
f) methods of controlling or preventing ponding of water, flooding, erosion, slides and subsidences of land;
g) use, handling and ultimate disposal of any chemical or toxic materials to be used in the land-use operation;
h) protection of wildlife habitat;
i) protection of objects and places of recreational, scenic and ecological value; and
j) the deposit of a security deposit.

Before issuing a land-use permit the Engineer* may request the applicant to supply within six months, an *environmental assessment* which will enable the Engineer to evaluate any qualitative and quantitative effects of the proposed operation on the land to be used.

The Engineer may include in the permit a condition that the permittee make a security deposit up to $100,000 computed at a rate not to exceed $1,000 per acre. The security deposit shall be refunded by the Minister when he is satisfied that the permittee has completed or discontinued the operation and has complied with the terms and conditions of the permit. Where the permittee has not complied with all of the conditions in the permit the Minister may refund such part of the security deposit as, in his opinion, the circumstances justify.

For the eighteen-month period between November '71 and April '73 during which the Land-Use Regulations have been in effect approximately 500 permits have been issued. Nearly 80% of these have been for oil and gas exploration with the remainder covering activities, such as mining exploration, road and airstrip construction.

Soon after the Land-Use Regulations were promulgated an interdisciplinary land-use committee, representing various federal and territorial departments, was formed to provide advice to the Engineer and to develop an interdepartmental position on each land-use application. In addition, a consultation process with the communities has been developed. Nevertheless, local or regional participation and the whole matter of land-use planning has not yet been adequately considered and considerable work in this area is needed. For discussion purposes, Part II of this paper provides one possible approach to the question.

*The Engineer referred to in the Land-Use Regulations is the Regional Manager, Water, Forests and Land.

Research

The gathering of scientific and technical data in the Canadian Arctic and sub-Arctic has a relatively long history; it includes in part the work of the Geological Survey of Canada, the National Research Council, the Canadian Wildlife Service, university researchers and the industrial sector. However, in relation to the vast area in question, the amount of research which had been carried out was minimal; much of what had been done was not directly applicable in the matter of managing the north's water, forest and land resources nor in determining the impact of extensive land and water use in the north.

These matters became apparent when the land-use regulations were being drafted and it was evident that as a result of the scarcity of scientific data the degree of restriction imposed on land-use operations was being set somewhat arbitrarily. To help alleviate this situation the *Arctic Land Use Research (ALUR)* program was established. (ALUR projects carried out in 1972/73 and 1973/74 are listed in Appendix I).

The basic objective of ALUR is to provide an information base for the administration and management of the north's water, forest and land. More specifically, the ALUR program falls into four broad categories.

1. Research directed to specific identifiable problems (for example, damage to tundra by ground vehicles, containment of mine tailings, land based oil spills).
2. Inventory of the resources of a given region and the assessment of the impact of different and possibly conflicting uses.
3. Terrain and land-use information mapping.
4. Co-ordination, management and assessment of ecological impact studies (for example, those related to the Mackenzie Highway).

The major portion of the ALUR program is carried out by university researchers under contract. Other federal agencies or departments, also under contract, conduct certain phases of the work, such as item (3) above and, on occasion, consulting firms are used.

An *Advisory Committee* has been established to aid ALUR in its role of providing scientific back-up to the resource management program. This committee consists of four members from the university community and four from industry with the ALUR Manager, an officer of the Water, Forests and Land Division, as chairman.* The members of the Advisory Committee represent a broad spectrum of scientific and industrial expertise and knowledge of northern conditions. The Committee is therefore able to provide the Department with valuable advice on:

a) extant and anticipated problems which require research;
b) an assessment of ongoing research;
c) the availability of research personnel, services and support facilities; and
d) evaluation of research proposals.

Also the Committee is particularly effective as a vehicle for the interchange of ideas and information among the scientific community, resource-based industry and the Department.

*Composition of the ALUR Advisory Committee is shown in Appendix II.

Organization

Water, Forests and Land Division

Reference was made earlier to the formation in 1968 of the Water, Forests and Land Division. This Division consists of a small interdisciplinary group (see Chart No. 1) responsible for providing professional and technical input to departmental policy related to the north's water, forest and land resources.

The Division's responsibilities include: drafting legislation and regulations of which the Northern Inland Waters Act and the Land-Use Regulations are two examples; designing and implementing research projects associated with land and water use; conducting various projects such as water and forest inventory surveys and the production of land-use information maps.

It is also responsible for developing and recommending policy, such as the question of land planning discussed in Part II of this paper.

Once a resource management program is established its value is directly related to the skill with which its administrators deal effectively and accurately with the private sector. It need not be stressed that the soundest policy will not remain viable if public support for the program is lost through recurrent administrative inefficiency.

Some regulatory control respecting natural resource utilization is probably necessary and undoubtedly, such control does tend to have an inhibiting effect on the user and compel him to revise some of his standard procedures and operating methods. Conversely, it is incumbent upon government to provide an effective mechanism capable of administering the program and responding to the private sector.

With the legislation and regulations referred to earlier in place, it was imperative that a strong resource management organization be established in the north. Thus by April 1973 the water, forests and land program had filled over 100 professional and technical staff positions, of which 85 were situated in the two regional organizations.

The five factors considered in planning the new field organization were as follows:

1. Each Territory would need a senior officer with support staff to administer the new Land-Use Regulations pursuant to the Territorial Lands Act.
2. Each Territory would need a staff of inspectors to be situated throughout the north where land-use activities were being carried out.
3. Under the Northern Inland Waters Act each Territory would require a senior departmental officer to sit on the Water Board established under the Act.
4. Each Water Board would need a full time support staff of water specialists.
5. The new water and land-use programs would have to be co-ordinated with existing land administration and forestry programs.

Regional Manager, Water, Forests and Land

Underlying the five factors listed above was the basic concept that the new organization should reflect an *integrated resource management* approach to the three fields of water, forests and land.

With this end in view the position of Regional Manager, Water, Forests and Land was established for each Territory. Each Regional Manager, in Whitehorse, Yukon Territory and Yellowknife, Northwest Territories, became part of the existing staff of the Regional Director of Resources. (See Charts, Nos. 2 and 3).*

In his overall responsibility for implementing the water, forests and land program the Regional Manager is the Engineer referred to in the Land-Use Regulations, (Item 1 above). He is also the department's representative on the Water Board and its Chairman under Section 7(3) pf the Northern Inland Waters Act.

Correspondingly in order to attain the objective of integrated resource management whereby decisions are based on a consideration of all inherent values, it is essential that the organization be multi-disciplinary. Thus far the water, forest and land organization, that is the regional operational arm in each Territory and the policy and planning group in Ottawa, includes the following disciplines: biology, botany, chemistry, civil engineering, ecology, forestry, geology, geomorphology and hydrology.

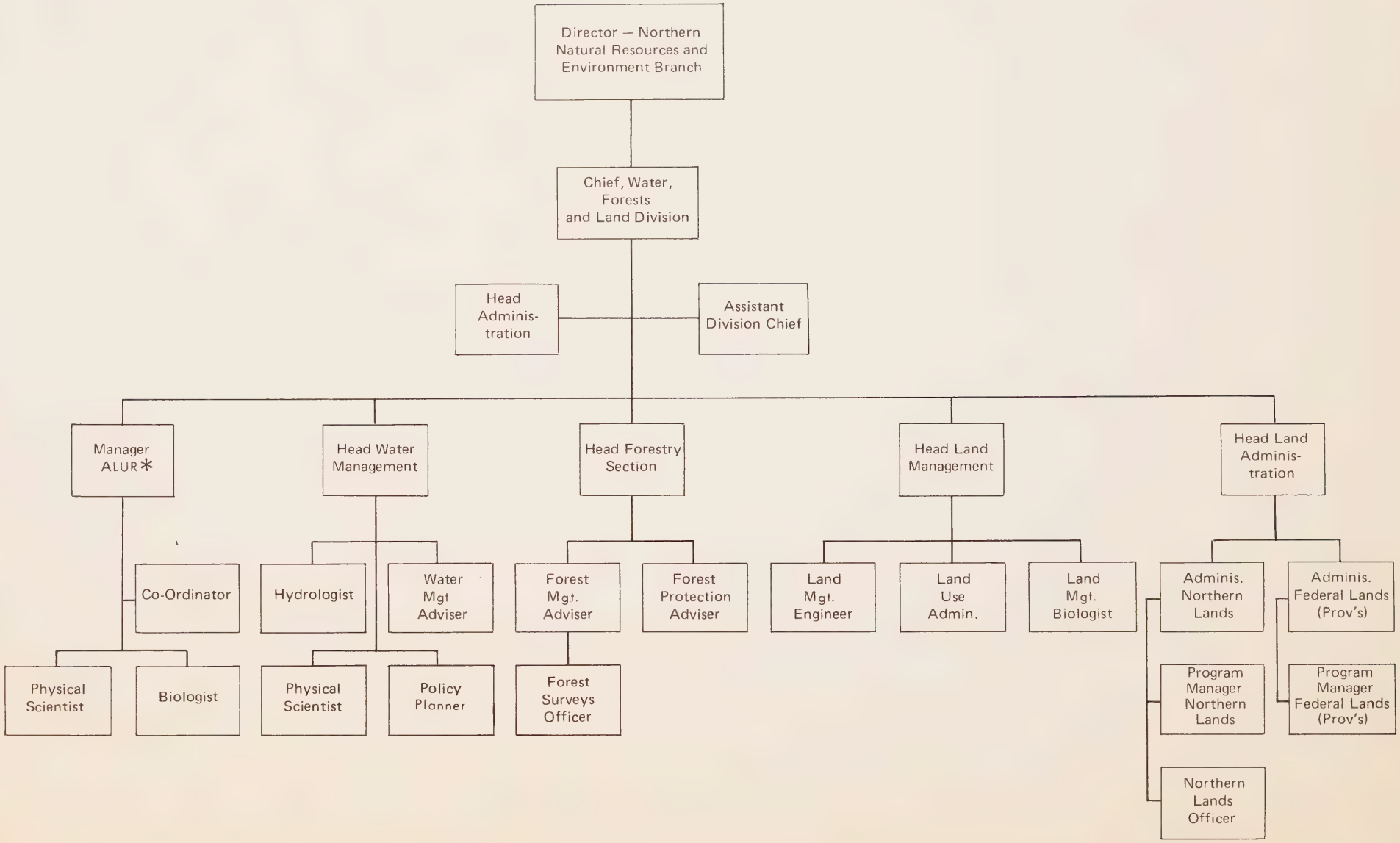
*At the time of writing, consideration was being given to some restructuring of the water, forests and land organization in the Northwest Territories due to the high level of development activity there.

Water, Forests and Land Field Organization 1973–74

- ▼ Regional Director
- ■ Regional Manager
- ● Superintendent – Lands and Forest Service
- ▽ District Superintendent
- ◇ Resource Management Officer
- ○ Assistant Resource Management Officer
- □ Land Management Personnel
- W Water Personnel

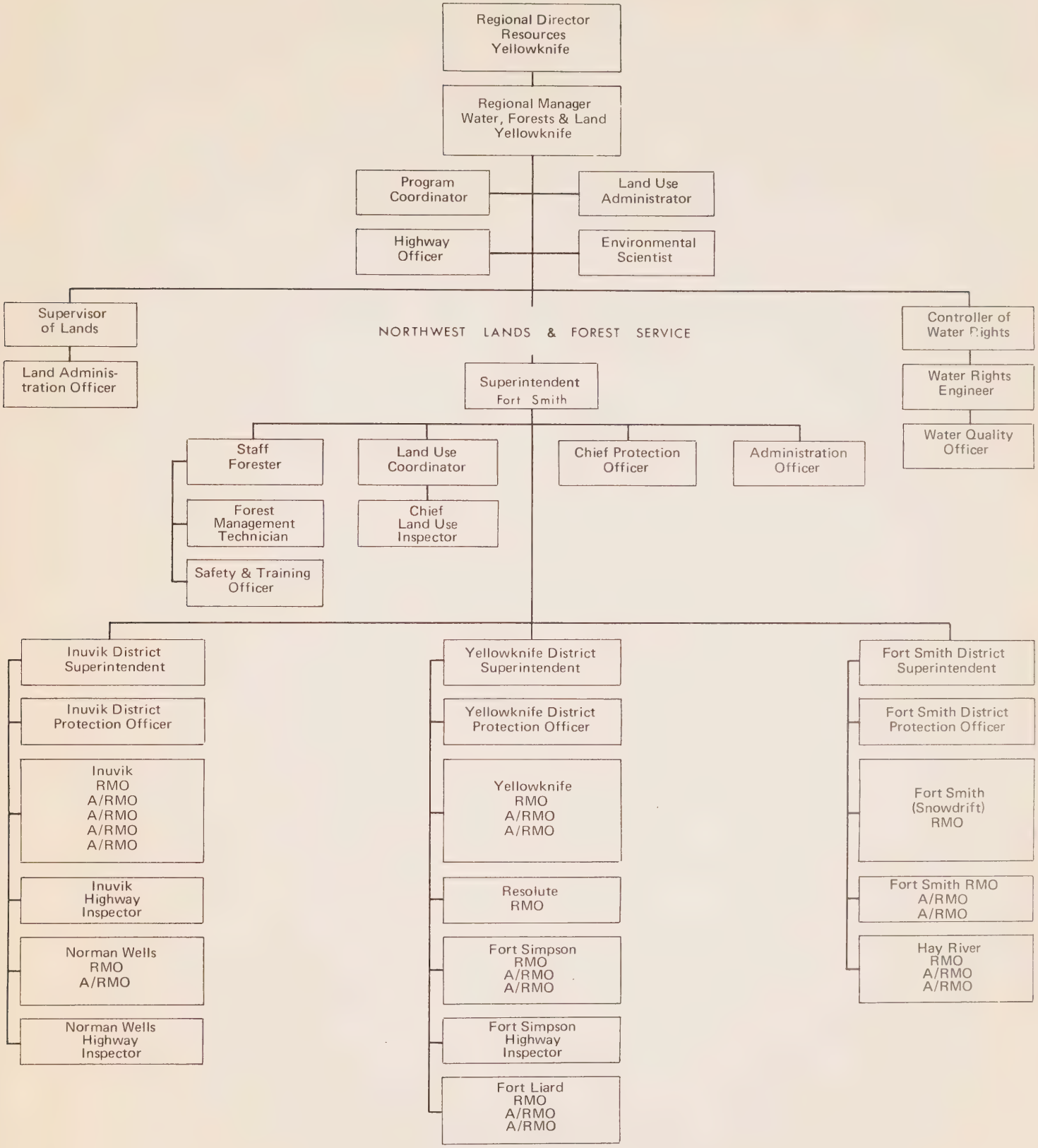
Water, Forests and Land Organization
Ottawa
(Professional and Technical Personnel)

(Chart No. 1)



*ALUR – Arctic Land Use Research

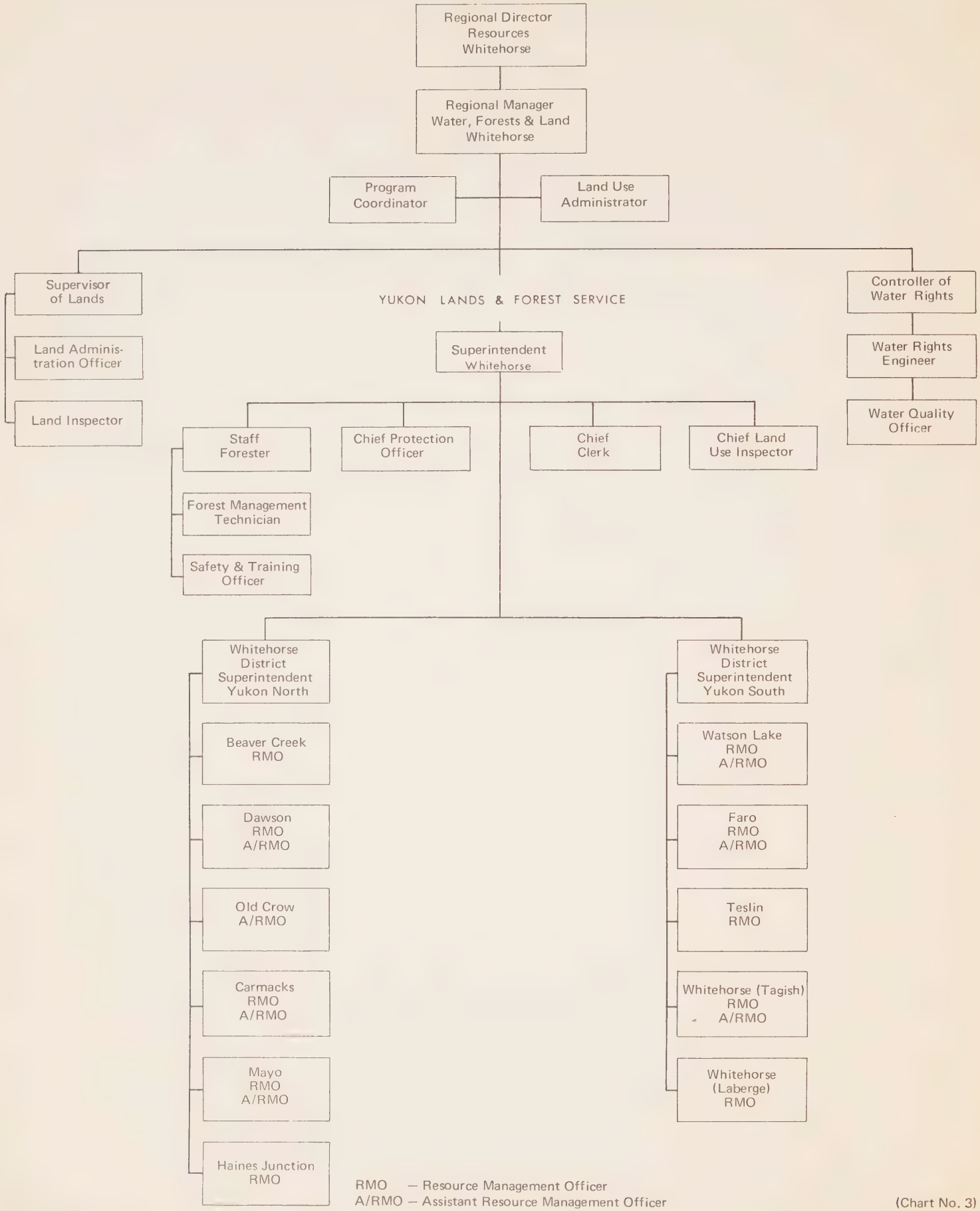
Water, Forests and Land Organization
Northwest Territories
(Professional – Technical Personnel)



RMO – Resource Management Officer
A/RMO – Assistant Resource Management Officer

(Chart No. 2)

Water, Forests and Land Organization
Yukon Territory
(Professional – Technical Personnel)



RMO — Resource Management Officer
A/RMO — Assistant Resource Management Officer

(Chart No. 3)

With the objective of benefitting from the considerable expertise which exists in other federal departments and outside of government, two mechanisms have been established to provide advice and recommendations to the department on water, forest and land matters. A third group, the ALUR Advisory Committee, has already been discussed in the section entitled Research. The first two referred to are:

Territorial Water Board
The two Water Boards referred to earlier have been established in Whitehorse, Yukon Territory and Yellowknife, Northwest Territories. Three members of each Board are named by the Commissioner in Council of the respective Territory and the other members of each Board represent the six federal departments most directly concerned with water management in the north. The federal departments represented are: Environment; National Health and Welfare; Energy, Mines and Resources; Public Works; Transport; Indian Affairs and Northern Development.

The Boards are responsible for co-ordinating water management activities in the north. In addition, they consider all water-use applications and make recommendations to the Minister of Indian Affairs and Northern Development concerning the issue of any licence.

Under the Act the Minister must provide each Board with a staff of professional and technical advisers from within the public service in order to carry out the business of the Board. The responsibilities of the advisers who are on the staff of the Regional Manager include:

a) reviewing and processing all applications for water licences;
b) providing guidance to operators on approved water use practices;
c) setting the terms of reference for water use impact studies in relation to applications for licences;
d) providing technical expertise and guidance to applicants and licencees; and
e) managing hydrometric and water quality networks in support of licencing.

Land-Use Advisory Committee
In each Territory there is a Land Use Advisory Committee under the chairmanship of the Regional Managers, Water, Forests and Land. The Land Use Advisory Committee reviews all of the land-use applications and submits recommendations to the Chairman (referred to in the Regulations as the Engineer) concerning the stipulations to be attached to each Land Use Permit. In the case of an application that proposes a land-use operation within a migratory-bird sanctuary, where the legislative authority is the Migratory Birds Act administered by the Canadian Wildlife Service, the applicant must also obtain a bird-sanctuary permit before he can commence operations.

The Land Use Advisory Committee is not established in legislation and does not have precisely the same representation in each Territory. However, in each case the Committee does include a fishery officer, a wildlife biologist (both representing the Department of the Environment), a game management officer and an engineer. In addition, in the Yukon Territory the committee includes a regional planner from the Territorial Government; in the Northwest Territories, an officer of the Indian Affairs Branch is included.

Often a land use operation is proposed for an area which may be of concern to a particular community, e.g., adjacent to or on traditional hunting and trapping grounds. In such cases the application, in addition to being reviewed by the Committee, is forwarded to the community where it may be reviewed and commented upon by one or more of the following: the community or hamlet council; the Band Council or the Trappers' Association. These comments are then considered along with those of the Advisory Committee in responding to the application.

Lands and Forest Service
The operational organizations responsible for administering the various regulations and for carrying out on-site inspections are the Yukon Lands and Forest Service with headquarters in Whitehorse, Yukon Territory, and the Northwest Lands and Forest Service with headquarters in Fort Smith, N.W.T.

Each Lands and Forest Service is under the direction of a Regional Superintendent who, in turn, is responsible to the Regional Manager. Each District, of which there are two in the Yukon and three in the N.W.T. is headed by a District Superintendent. Each District is divided into 'Areas'. The Area, which is managed by a Resource Management Officer, who may have several technical assistants, forms the basic working unit of the Service. There may be, within any 'Area', a wide range of resource management activities, including: land-use enforcement; land administration; timber management; water quality control; and forest fire management.

Part II
A Proposal

Northern Land-Use Planning

Although the utilization of northern land has been relatively low so far, there have been conflicts between users. It is very possible that well before the end of the present decade this picture will change substantially and the demand for northern land will increase considerably.

By the late 1970's, according to present policy, the Dempster Highway in the Yukon and the Mackenzie Highway in the Northwest Territories will have been built to the Arctic Ocean and, in the process, the north will be the recipient of an additional 1,000 miles of all-weather road. During the same period it is possible that at least one large diameter pipeline will be constructed out of the north and that the Yukon's railroad system will be extended. Development of this magnitude will have a major effect upon existing land use patterns.

Superimposed on these physical changes are such things as the federal government's new regional planning program for the north, the native peoples' concern about land claims and traditional land uses and the federal and territorial governments' desire to proceed with legislation and ordinances with the objective of ensuring orderly development as the north is opened up.

Herein lies the difficulty. If orderly development of northern lands is to be attained, such things as legislation, ordinances and regional planning must be based upon a solid framework. While the implications are complex the basic considerations are not and a simple analogy will suffice to make it clear.

A good carpenter is as concerned about the quality of the lumber in his sub-roof as of the cedar shingles he lays on top. His decision to use No. 1 shingles, properly spaced with the correct overlap, would be of little consequence if he chose to secure them to a sub-roof of cull lumber which was incapable of effectively holding nails. Weather would take its toll and soon shingles would begin to fly.

It was shown earlier in this paper that, thus far, the administration of northern public lands * consists of two elements: a mechanism for disposal by sale or lease and a system for controlling various activities affecting the land surface. Clearly, the introduction of a third element, *land use planning,* is necessary before it can be said that we have the solid framework referred to above. What does this mechanism, which will provide for the rational disposition and utilization of northern land, consist of?

*'Land' as discussed in this proposal does not include lands in and around communities.

Before addressing that question, which essentially is Part II of this paper, a word of explanation is necessary.

Returning for a moment to the roof analogy, although it is important to lay cedar shingles on a sound base the sub-roof itself may be built of various materials including lumber, plywood, particle board or a combination thereof and, to a large degree, the choice depends upon the user's preference. Similarily, there are probably several ways of attaining the desired objectives with respect to land-use planning but, in depicting one, hopefully it will precipitate a debate which will result in a better approach or at least provide alternatives from which the government can then choose. In any event, it must be understood that the proposal which follows is as yet in the formative stage.

Land-Use Planning—What Is It?

Northern land-use planning might be considered as a seven-phase process.

I. An inventory of the natural values of the land-base such as wildlife habitat, recreation, forestry, agriculture, known minerals and hydrocarbon deposit.
II. The identification and analysis of the social, cultural and technological uses of the land.
III. The determination of the physical properties of the terrain and its performance when subjected to various kinds of man-induced alteration.
IV. The systematic presentation or classification of the land, based on its composite value determined in phases I, II and III.
V. The determination of management criteria and management structures to meet those criteria.
VI. The formation and operation of a mechanism for regional participation; and
VII. Political decisions reflected in legislation.

Note: see an elaboration of phases I-III in Appendix III.

Values and Characteristics of Land Base

The comprehensive examination of the land-base as outlined in phases I-IV constitutes a major mapping program. From that program key land values will be geographically delineated such as the following: *

*A *Land-Use Information* Map Series which is being produced for, and at the request of, the Department of Indian and Northern Affairs by Environment Canada, provides much of the kinds of data cited. To date the series covers approximately 500,000 kms² in the Yukon and Northwest Territories. Phase I also requires, in certain areas, that the land be classified according to ecological criteria. This system will provide information on the *potential* of land in terms of agriculture, forestry, wildlife and recreation.

1. Hunting, trapping and fishing areas valuable to local communities.
2. Critical wildlife areas, such as valuable furbearer habitat, migration routes, breeding grounds, bird staging and nesting areas.
3. Important fish spawning areas and fish migration routes.
4. Areas of distinctive recreation and aesthetic value.
5. Known archaeological sites and areas of archaeological interest.
6. Location of proved oil, gas and mineral reserves and other areas of high potential in terms of non-renewable resources.
7. Location of areas of productive forest and arable lands.

In addition to the key land values, specific information on terrain conditions will be produced including:

1. Terrain inventory maps which include the nature of surface and near-surface materials, landforms, permafrost, ground ice, muskeg and areas of eroded ground.
2. Terrain sensitivity maps which will provide a description of standard terrain units, in such terms as landform, material, ground ice and muskeg cover, and will rate each unit in terms of its sensitivity or performance when subjected to various kinds of disturbance. *

Following this comprehensive evaluation of the values and characteristics of the land base an interdisciplinary group would then establish management criteria and structures for northern lands.

Management Criteria
Management criteria for northern lands** would include the following:

1. permit technological activity such as resource exploration and production by the private sector and highway and airport construction by government;
2. maintain the productive capacity of the land in terms of hunting, trapping, fishing, forestry and agriculture;
3. maintain areas of high aesthetic and recreational value;
4. safeguard critical wildlife and waterfowl habitat such as migration routes, nesting areas and breeding grounds;
5. preserve sufficient vegetative cover to maintain soil stability and water control; and
6. minimize the possibility of inadvertently altering or disturbing archaeological; historic and ecological research sites.

Management Structure
It is suggested that in considering the question of land-use it is necessary to recognize the difference between controlling the activity which takes place on the land and controlling the uses to which land is put.

Particular activities or operations can be controlled by regulations and covenants whereas consideration of the use or uses to which land is put must be from the standpoint of land disposition. Effective control of the latter may require that land alienation be limited to leases, permits or licences of occupation, i.e., that title to public lands be retained by the Crown.

By relating the criteria developed above to the values and the bio-physical characteristics of the land-base determined in phases I through IV, the land management structure could consist of:

—*managed-use land*
—*natural-use land*
—*recreation land*
—*special reserve land*

The designation of the four land categories as managed-use, natural-use, recreation and special reserve indicates those values of the land-base which are considered to be of prime importance for that particular sub-zone. Thus policy with respect to land alienation and use within any sub-zone would be consistent with the designated priority.

*For example, peatlands near Arctic Red River, N.W.T. are described in part, as having a moderate to high ice content; commonly up to 20% and locally up to 60% segregated ice by volume within peat; typically up to 3 feet (1 m.) and locally up to 9 feet (3 m.) total thickness of segregated ice in mineral soil immediately below the peat. With respect to terrain performance it is pointed out that the removal of vegetation in peatland types can lead to subsidence of 5 to 15 feet (3 to 5 m.). Information derived from *Terrain Classification and Sensitivity Series* maps, produced by Geological Survey of Canada in concert with Indian and Northern Affairs.

**As stated in an earlier footnote 'lands' in this paper do not include those in and around communities: hence the management criteria reflect a regional rather than an 'urban' approach to land-use planning.

Managed-use lands would be those in which the prime values are related to technological activity; e.g., the production of timber or the extraction of oil and gas. In many cases 'other values' would exist in managed-use lands, such as wildlife habitat or areas of recreational value. In such cases those overlapping values, although not receiving preference, would be protected to some extent by means of terms and conditions placed upon the land-user.

If the use of the land was to cover a period of several years then the vehicle of control would be the restrictive covenants in the document affording the holder surface rights. On the other hand if the use is for a transitory period then control would be exercised through stipulations pursuant to a temporary permit such as that provided under the present Land-Use Regulations.

In order for the latter to be completely effective it is necessary that the Lands Act providing for the use of such permits supersede all other Acts pertaining to resource extraction and utilization. Under existing Canadian federal legislation, an amendment to the Yukon Quartz Mining Act is required before the Territorial Land-Use Regulations can apply to the mining industry in the Yukon.

While other land values would receive certain protection through the mechanisms cited above there would be no assurance that detrimental changes would never occur. For this reason the establishment of, for example, wilderness camps, tourist lodges or private cottage sites, would not be encouraged within managed-use lands. If such ventures were undertaken it would be with the clear understanding that potentially conflicting land-uses, such as airports, highways, resource exploration and production, although controlled would not be precluded.

Natural-use lands include critical wildlife areas such as nesting and breeding grounds and waterfowl staging areas as well as important hunting and trapping areas.

Policy pertaining to the questions of land disposal and utilization within natural areas would reflect concern for the ecological aspects of the habitat per se and the social and cultural concerns of the north's native population with respect to hunting and trapping areas.

In *natural-use lands* the nature and extent of land alienations and use would be stringently controlled. Transitory activities might be permitted subject to severe restriction with respect to, for example, timing and location.

Recreation lands would include those areas identified as being of distinctive aesthetic and recreational value. They would include areas particularly suitable for such purposes as parks, camp-grounds, wilderness camps, and private cottage-lot development.

In such designated areas decisions respecting land disposal and utilization would be weighted in favour of aesthetic and recreational values. The degree of restriction placed on any activity, other than that related to recreation, would range from considerable to total. In this respect, the legislation pertaining to land disposal and utilization within *recreation lands* would have to provide for delineating the areas and describe the nature of acceptable land use for each area.

Special reserve lands refer to those specific areas of archaeological or scientific interest. In most cases the sites would be measured in tens of acres although some areas reserved for scientific purposes may be larger.

It is suggested that a 'Special Reserve Act' may be necessary in order to designate such areas. The intention would be to provide legislative authority for delineating small areas and precluding any activity within them except that authorized under the Act for purposes of carrying out scientific investigation and research.

The classification of the land-base into the four categories suggested provides a structure for land-use control and land disposition. However, it should be recognized that the classification also provides a framework for other phases of renewable-resource management. For example, forest harvesting would not be allowed in Special Reserve Lands and the application of water-use licencing and water pollution control would be very stringent in and adjacent to Recreation Lands.

Regional Participation
The next step, following the implementation of phases I-V is to establish a mechanism whereby local residents have an opportunity to participate in the planning process. In this way regional objectives, based on particular social and cultural characteristics of an area can be reflected in the land policy. Regional participation would probably be more effective, considering the vastness of the area and the variations in the land-base if the Territories were divided into a number of *regional zones.*

A zone could be related to potential uses, such as a transportation corridor; alternatively it could be determined on the basis of the inherent physical and biological characteristics of a particular area. A regional zone might also be delineated in such a way as to include a particular group of settlements or communities which tend to share certain common interests or objectives. An example of each of the alternatives cited would be, respectively: the Mackenzie Valley, groups of Arctic Islands, and the four Mackenzie Delta communities of Inuvik, Aklavik, Arctic Red River and Fort McPherson.

Regional participation, would include consideration of the management criteria and structures for the land within a zone and making recommendations to the Minister of Indian Affairs and Northern Development on matters pertaining to land-use and land disposition.

In Conclusion

Many, and sometimes conflicting, demands are now being made upon Canada's northern lands and it seems reasonable to assume that such competition will not abate in the future. In view of this, it is imperative that a land-use policy be developed which will at least reduce the number of decisions, respecting land disposition and utilization, made in isolation without reference to a predetermined structure of objectives and criteria.

The complexity of land-use problems should not be underestimated; nevertheless, it is suggested that an effective land-use policy can be developed if the following are incorporated into the planning procedure:

a) recognition of all of the inherent physical values and properties of the land base;
b) recognition of the social, cultural and economic values of the land;
c) regional participation in the determination of land management criteria and structures; and
d) a federal legislative base, to embody the regional plan which will also provide for the recognition of inter-regional factors and national interests.

It is suggested that a land-use plan so structured would provide an effective mechanism for considering all land matters including those pertaining to native lands, private sector activity and government sponsored projects.

Two basic issues arise from the proposal presented in this paper. One is the need to recognize the composite value of the land-base which includes social, cultural, economic and physical factors and the other is the requirement to provide for regional participation in the decision-making process. The incorporation of these prerequisites into a northern land-use plan would indeed move Canada *toward a northern balance.*

Appendix I
ALUR Projects

1972–73

1. *Land-Use Studies, Upper Liard River Watershed*
Establishment of baseline data on physical environment parameters in the boreal forest region and determination of the effects of removing the forest cover, particularly on erosion rates and on the hydrological regime.

2. *Disturbance Studies in the Mackenzie Delta Region*
Investigation of environmental impact associated with oil and gas exploration activity in an arctic tundra environment. The effect of different levels of disturbance on the vegetative cover and the permafrost terrain are being studied in order to assist in the establishment of acceptable operating practices.

3. *Devon Island Ecosystem and Manipulation Project*
This work is being carried on as part of the Devon Island IBP project and involves establishment of base-line data for maintaining plant cover and large mammal habitat in the High Arctic during resource exploration and development.

4. *Impact of Tracked and Wheeled Vehicles on the Tundra*
Several wheeled and tracked vehicles have been operated at test sites at Tununuk and Tuktoyaktuk in order to investigate the immediate and long-term effects of operating in the tundra, particularly in the summer months.

5. *Energy Budget Components in an Arctic Environment*
Measurement of energy budget components over disturbed and undisturbed areas in order to classify and quantify levels of terrain disturbance by relating them to changes in the partitioning of incident energy. This work has been carried out in association with the studies on tracked and wheeled vehicles.

6. *Vegetation Studies in the Mackenzie River Region*
Revegetation, as a means of stabilizing and restoring disturbed areas, is being investigated; attention is being given to the identification of species which can be successfully used for this purpose and to fertilization and other techniques which facilitate re-establishment of plant cover.

7. *Water Quality and Mine Waste Containment*
An investigation of the problems of containment of mine wastes under northern climatic conditions and the associated effects on water quality. An extensive study of two mine sites at Yellowknife was completed in 1972. In addition, water quality at two mine sites on Great Bear Lake was investigated and studies were initiated on the toxicity of flotation agents used in ore processing.

8. *Preliminary Study on Land-Use Management, Southern Yukon*
This work was undertaken in order to assemble and analyse the information necessary to design a comprehensive land use management study in the Southern Yukon. It is anticipated that the major study will begin in 1973–74.

9. *Land-Use Information Maps*
These maps depict available information on renewable resources and man-related activities including transportation routes, hydrometric stations, hydro sites, mines, oil and gas wells, archaeological sites, proposed IBP reserves, recreational areas, fish, wildlife and hunting and trapping areas. 44 map sheets, at a scale of 1:250,000 have been completed for the Mackenzie Valley and Northern Yukon, approximately 20 map sheets covering western and southern parts of the Yukon Territory at the same scale will be completed by the spring of 1973. Maps for the remainder of the Yukon Territory will be completed by the spring of 1974.

10. *Terrain Sensitivity Mapping*
A methodology for the assessment of the sensitivity of terrain to surface disturbance based largely on a consideration of surficial geology, has been developed. Maps accompanied by a detailed legend and a sensitivity index for each map unit are being prepared for the Mackenzie Valley and Northern Yukon in 1972–73.

11. *ERTS Satellite Imagery*
The potential uses of ERTS imagery for identifying and monitoring environmental features that are significant in the development of natural resources in northern regions is being examined.

12. *Land Disturbance Studies in the Boreal Forest, Mackenzie River Valley*
An appraisal of the interrelationships of vegetation, soils and landforms was carried out at selected sites near Wrigley, N.W.T. The work supplements more general surveys carried out by the Geological Survey of Canada and the results are used in terrain classification and assessment of terrain sensitivity.

13. *Land Base Oil Spills*
A major study on the physical, biological and microbiological effects of oil spills on land was initiated in 1972; field work is being carried out at Norman Wells using Norman Wells crude oil, complemented by comparative laboratory studies using other northern crudes.

14. *Waste Disposal*
The problems associated with waste disposal from exploration and construction camps have been examined in order to establish appropriate terms and conditions for the operation of such camps, with particular reference to pipeline construction projects.

15. *Archaeological Studies*
An extensive examination of available literature sources and aerial photography, supplemented by limited field surveys, is being undertaken to identify and assess sites of historical and archaeological importance in the proposed pipeline corridor.

1973–74
1. *Physical Environmental Studies in the Watson Lake Area, Y.T.*
This study will compile baseline data from an undisturbed boreal forest ecosystem for use as a control in measuring the environmental effects of land use operations and to evaluate the immediate and long-term effects of timber harvesting and other land use activities such as road construction and resource exploration. This is the fourth and final year of this project.

2. *Land-Use Information Maps*
Preparation of 17 maps at a scale of 1:250,000 covering the Mackenzie and Selwyn Mountains south of 66°N latitude, integrating a range of data on renewable resources and related human activities.

3. *Mine Wastes and Mine Waste Containment*
An investigation of the problems of containment of mine wastes under northern climatic conditions and the associated effects on water quality; an examination of short-term toxicity using standard bioassay tests and of long-term toxicity using representative Arctic organisms.

4. *IBP Devon Island Project on Biological Productivity in the High Arctic Tundra*
A study to determine how the total ecological system of the area functions in order to be able to predict for it and other areas in the Arctic Islands what will be the consequences of major stresses. The results will assist in evaluating the effects of such activities as summer and winter seismic operations, gas field development, spillage of fuel oil.

5. *Impact of Fire on Forest and Tundra Ecosystems*
An examination of the ecological effects of fire in order to identify areas where fire susceptibility creates special problems in relation to industrial development and to determine the degree of fire protection necessary and to provide a scientific basis for the establishment of a rational policy on forest fire fighting in the caribou range and other areas.

6. *Study on Legal Aspects of Land-Use Planning in the Canadian North*
An analysis of the existing legal framework in various jurisdictions in relation to land disposal and land-use planning in the Canadian North.

7. *Evaluation of Potential Uses of ERTS Satellite Imagery for Land-Use Studies in the Canadian North*
An evaluation of the potential use of ERTS satellite imagery as a resource management tool in the Canadian North; also as a means of detecting and monitoring environmental disturbance and damage caused by resource exploration and development activities.

8. *Disturbance Studies in the Arctic Islands*
An evaluation of immediate and long-term effects of industrial exploration and development activities on vegetation and terrain of various types and examination of the requirements for maintaining or restoring plant cover.

9. *Terrain Sensitivity Photomosaics and Related Land-Use Classification Charts*
A study to devise a methodology for establishing the relative tolerance or sensitivity of terrain units in the Arctic Islands and to produce a terrain sensitivity classification system. As an initial project map sheets are being produced covering:

a) Fosheim Peninsula, Ellesmere Island, 12 photomosaics;
b) Ellef Ringnes and King Christian Island, 9 photomosaics; and
c) East Half of Melville Island, 11 photomosaics.

Projects partly funded by Environmental-Social Program, Northern Pipelines
1. *Disturbance Studies in the Mackenzie River Region*
A study to identify terrain types and plant communities and investigate their relative tolerance to surface disturbances, including movement of vehicles and equipment, in order to develop guidelines for operating practice.

2. *Energy Budget Components in an Arctic Environment*
Identification of energy budget components over disturbed and undisturbed areas in order to classify and quantify levels of terrain disturbance by relating them to changes in budget components.

Projects funded entirely by Environmental-Social Program, Northern Pipelines

1. *Land–Based Oil Spills*
An investigation of the physical characteristics and biological and microbiological effects of spills in the Mackenzie Valley and an evaluation of microbial degradation as a means of cleaning up oil spills.

2. *Waste Disposal*
An investigation of various methods of sewage disposal and solid waste disposal with particular reference to their applicability to northern climatic conditions. The work is being carried out in collaboration with the Environmental Protection Service, Department of Environment.

3. *Archaeological Studies*
A reconnaissance survey of the principal areas of archaeological and historical interest in the proposed pipeline corridor.

4. *Terrain Sensitivity Mapping*
Completion of terrain sensitivity maps for the Mackenzie Valley and Northern Yukon using existing information on geology, soils and vegetation.

Appendix II
ALUR Program Advisory Committee

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ALUR Manager,
Water, Forests and Land Division,
Indian and Northern Affairs.

Mr. D.T. Crossley,
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Northwest Pulp and Power Limited,
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Vice-President,
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Panarctic Oils Limited,
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Dr. W.A. Fuller,
Chairman,
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Dr. L.W. Gold,
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Division of Building Research,
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University of Toronto.

Mr. R.J.C. Tait,
Chief Metalurgist,
Esctall Mining Limited,
Timmins, Ontario.

Appendix III
Resource Values

The identification and analysis of all the resource values inherent in the land base would include:

1. *Related natural values:*
a) wildlife habitat;
b) fish;
c) aesthetic; and
d) archaeological/historic sites.

2. *Physical properties:*
a) surface and near surface materials;
b) permafrost;
c) ground ice;
d) vegetation;
e) sub-surface mineral and hydrocarbon deposits; and
f) water.

3. *Performance or sensitivity of land surface when subjected to various forms of man-induced alteration.*

4. *Social and cultural uses of the land:*
a) hunting;
b) trapping;
c) fishing;
d) recreation; and
e) native burial grounds or sacred areas.

5. *Technological uses:*
a) oil and gas development;
b) mining;
c) timber utilization;
d) transportation e.g., highways, pipelines; and
e) quarrying.

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